Tianyu Yang, Ph.D.
(217)693-1652 || tyang123@asu.edu || Assistant Professor in Mechanical Engineering at Arizona State University

EDUCATION

Postdoctoral scholar in Querrey Simpson Institute for Bioelectronics 2021-2024
Northwestern University, Illinois, USA
Research focus: Heat transfer in bioelectronics
Adviser: Professor John A. Rogers

Doctor of Philosophy in Mechanical Engineering 2016-2021
University of Illinois at Urbana-Champaign, Illinois, USA
Thesis focus: Controlling heat transfer in electronic packaging using thermal switches and high-power thermal buffers
Advisers: Professors William P. King and Nenad Miljkovic
Awards: UIUC Department Fellowship and Soo Fellowship (2016-2017)

Bachelor of Science in Engineering Mechanics and Aerospace Engineering 2012-2016
Tsinghua University, Beijing, China

JOURNAL PUBLICATIONS

Google scholar: https://scholar.google.com/citations?hl=en&tzom=360&user=OmBV67MAAAAJ

1. Jiaqi Liu et al., "Bioresorbable shape-adaptive structures for ultrasonic monitoring of deep-tissue homeostasis." Science, 383,1096-1103, 2024.
2. Kim, S., **T. Yang**, N. Miljkovic*, and W.P. King*, "Phase Change Material Integrated Cooling for Transient Thermal Management of Electronic Devices," International Journal of Heat and Mass Transfer, 213, 124263, 2023, https://doi.org/10.1016/j.ijheatmasstransfer.2023.124263.
3. Oh S.†*, Yoo J.†, Maeng W.†, S. Yoo, **T. Yang**, S. Slattery, S. Pessano, E. Chang, H. Jeong, J. Kim, H. Ahn, Y. Kim, J. Kim, S. Xu, D. Weese-Mayer, J.A. Rogers*, "Simple, Miniaturized Biosensors for Wireless Mapping of Thermoregulatory Responses," Biosensors and Bioelectronics, 237, 2023.
4. Liu, C.†, Kim, J.†, Yang, D.†, Cho, D.†, S. Yoo, S. Madhvapathy, H. Jeong, **T. Yang**, H. Luan, R. Avila, J. Park, Y. Wu, K. Bryant, M. Cho, J. Lee, J. Kwak, W. Ryu, Y. Huang*, R. Nuzzo*, and J.A. Rogers*, "Multifunctional Materials Strategies for Enhanced Safety of Wireless, Skin-Interfaced Bioelectronic Devices," Advanced Functional Materials, 34, 2023.
5. Yoo, S.†, **Yang, T.**† (†co-first author), . . . N. Miljkovic, W.P. King*, and J.A. Rogers*, "Responsive Materials and Mechanisms as Thermal Safety Systems for Skin-Interfaced Electronic Devices," Nature Communications, 14 (1024), 2023, https://doi.org/10.1038/s41467-023-36690-y, featured.
6. Park, M.†, Yoo, J.Y.†, **Yang, T.**† (†co-first author), Jung, Y.H.†, . . . N. Miljkovic, Y. Huang, W.P. King*, and J.A. Rogers*, "Skin-Integrated Systems for Power Efficient, Programmable Thermal Sensations across Large Body Areas," Proceedings of the National Academy of Sciences, 120 (6) p. e2217828120, 2023, doi: 10.1073/pnas.2217828120.
7. **Yang, T.**, F. Diao, A. Mantooth, Y. Zhao, W.P. King, and N. Miljkovic, "Heat Spreader Thermal Switch for Power Converter Isothermalization," IEEE Transactions on Components, Packaging and Manufacturing Technology, 12 (7), pp. 1063-1081, 2022, doi: 10.1109/TCPMT.2022.3185972.
8. **Yang, T.**, W.P. King, and N. Miljkovic, "Phase Change Material-Based Thermal Energy Storage," Cell Reports Physical Science, 2 (8), 100540, 2022, https://doi.org/10.1016/j.xcrp.2021.100540.
9. Wang, J., P. Birbarah, D. Docimo, **T. Yang**, A.G. Alleyne, N. Miljkovic, "Nanostructured Jumping-Droplet Thermal Rectifier," Physical Review E, 103, 2021, doi: 10.1103/PhysRevE.103.023110.
10. **Yang, T.**, P.V. Braun, N. Miljkovic, and W.P. King, "Phase Change Material Heat Sink for Transient Cooling of High Power Devices," International Journal of Heat and Mass Transfer, 170, 121033, 2021, https://doi.org/10.1016/j.ijheatmasstransfer.2021.121033.
11. Yi, X., **T. Yang**, X. Qiao, N. Miljkovic, W.P. King, and K.S. Haran, "Equivalent Thermal Conductivity Prediction of Form-Wound Windings with Litz Wire including Transposition Effects", IEEE Transactions on Industry Applications, 57 (2), pp. 1440-1449, 2021, doi: 10.1109/TIA.2021.3053500.
12. **Yang, T.**, J.G. Kang, P.B. Weisensee, B. Kwon, P.V. Braun, N. Miljkovic, and W.P. King, "A Composite Phase Change Material Thermal Buffer Based on Porous Metal Foam and Low-Melting-Temperature Metal Alloy," Applied Physics Letters, 116, 071901, 2020, https://doi.org/10.1063/1.5135568.
13. Kwon B., T. Foulkes, **T. Yang**, N. Miljkovic, and W.P. King, "Air Jet Impingement Cooling of Electronic Devices," IEEE Transactions on Components, Packaging and Manufacturing Technology, 10 (2), pp. 220-229, 2020, doi: 10.1109/TCPMT.2019.2936852.
14. **Yang, T.**, T. Foulkes, B. Kwon, J.G. Kang, P.V. Braun, W.P. King, and N. Miljkovic, "An Integrated Liquid Metal Thermal Switch for Active Thermal Management of Electronics," IEEE Transactions on Components, Packaging and Manufacturing Technology, 9 (12), pp. 2341-2351, 2019, doi: 10.1109/TCPMT.2019.2930089.
15. **Yang, T.**, B. Kwon, P.B. Weisensee, J.G. Kang, X. Li, P.V. Braun, N. Miljkovic, and W.P. King, "Millimeter-Scale Liquid Metal Droplet Thermal Switch," Applied Physics Letters, 112, 063505, 2018, https://doi.org/10.1063/1.5013623.

CONFERENCE PUBLICATIONS AND PRESENTATIONS

16. **Yang, T.**, P. B. Weisensee, J.G. Kang, B. Kwon, X. Li, P.V. Braun, N. Miljkovic, W.P. King, "Millimeter-Scale Thermal Switch Based on Liquid Metal Droplet," ASME International Conference on Nanochannels, Microchannels and Minichannels, August 27-30, 2017, Cambridge, MA, ICNMM2017-5544
17. Kwon, B., T. Foulkes, **T. Yang**, N. Miljkovic, and W.P. King, "Additively Manufactured Impinging Air Jet Cooler for High-Power Electronic Devices," Proceedings of the Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, IEEE ITherm, Las Vegas, NV, May 28 - 31, 2019
18. Yi, X., X. Qiao, **T. Yang**, K.S. Haran, and N. Miljkovic, "Equivalent Thermal Conductivity Prediction of Form-Wound Windings with Litz Wire Considering Transposition Effect", IEEE International Electric Machines & Drives Conference (IEMDC), 2019
19. **Yang, T.**, F. Diao, A. Mantooth, Y. Zhao, W.P. King, N. Miljkovic, "Thermal-Switch-Enabled Power Electronics Isothermalization", ASME 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, InterPACK2019, Anaheim, CA, October 7-9, 2019.

PATENTS

1. W. P. King, N. Miljkovic, P. B. Weisensee, B. Kwon, **T. Yang**, "*Active thermal management systems for electronic devices and method of achieving device-to-device isothermalization*", US20190307025A1
2. J.A. Rogers, **T. Yang**, S. Yoo, "*Thermal safety systems*", Invention ID: Disc-ID-23-02-21-001

ACADEMIA ACTIVITIES AND SERVICES

Invited Talk on Thermo-Electro-Mechanical Management in Electronics February 18 –20, 2024
Arizona State University, Tempe, AZ

Invited Talk on Heat Transfer in Electronics and Biomedical Devices March 7 – 8, 2024
Clemson University, Clemson, SC

Duke Engineering Future Faculty of Innovation and Excellence (DEFINE) October 18 – 21, 2023
Duke University, Durham, NC

Invited Talk on Decarbonized Energy April 30 – May 1, 2023
University of Central Florida, Orlando, FL

Lecture on Thermal Transport in Living Tissue 2023, 2024

Research Funding Proposal to Robert H. Lurie Comprehensive Cancer Center (received $15,000)

Research Assistant in Engineering Research Center for Power Optimization for Electro-Thermal Systems (POETS) Sponsored by NSF 2016 - 2021
University of Illinois at Urbana-Champaign, Champaign, IL

Services as Research Article Reviewer for over 7 Prestigious Journals Including International Journal of Heat and Mass Transfer, Applied Energy, Applied Thermal Engineering, Chemical Engineering Journal, and International Journal of Thermal Sciences

Services as Poster Reviewer for 2023 22nd IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm)

RESEARCH PROJECTS AND EXPERIENCE

Liquid Metal Droplet Thermal Switch for Active Thermal Management of Electronics

- Developed and characterized a millimeter-scale liquid metal thermal switch with high ON/OFF switching ratios > 70
- Integrated the liquid metal thermal switch with one and two GaN devices on a printed circuit board (PCB)

A Solid Heat Spreader Thermal Switch for Power Converter Isothermalization

- Designed and demonstrated a solid dynamic thermal switch to isothermalize a 3 kW power converter

Composite Phase Change Material Thermal Buffer for Transient Cooling of High Power Devices

- Fabricated a composite phase change material (PCM) thermal buffer consisting of the copper foam (high thermal conductivity) and the low-melting-point (60 °C) Field's metal (high volumetric latent heat)
- Developed a composite PCM heat sink for transient cooling of GaN devices generating pulsed heat losses > 50 W/cm^2

Thermal Safety Systems for Bioelectronics

- Developed a passive expandable thermal barrier to automatically remove bio-electronics failures at risky temperatures
- Developed a flexible breakable fuse to automatically shut down bioelectronics under failures

Bio-Integrated Devices for Thermal Actuation, Sensation, and Interaction

- Developed flexible thermal switches for programmable thermal stimulations and power efficiency
- Developed a thermal lymphedema sensor to monitor lymphatic obstruction and deep-skin hydration for early-stage lymphedema detection and intervention
- Developing an active flexible cooling system for body temperature control, nerve cooling and pain management
- Developing a thermal actuator/sensor for temperature-reactive vasoconstriction/vasodilation